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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/928,462	08/22/2001	Yim Bun Patrick Kwan	P 265272 P-0201.010-US	7375
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PILLSBURY WINTHROP, LLP			BROWN, KHALED	
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2877

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/928,462

Applicant(s)

KWAN, YIM BUN PATRICK

Examiner

Khaled Brown

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 August 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed. .
- 6) ☒ Claim(s) 1-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 August 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6,8.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are: on p. 13 line 21, "radiation system Ex,IL" (Ex and IL have not been defined at this point in the spec), on p. 13 line 26 and on p. 14 line 2, "item PL" (it is unclear what is PL), on p.14 line 11, "The source LA" should be The radiation source LA as disclosed on p. 13 line 22, on p. 13 line 21, "radiation system Ex" should be Beam Expander Ex as disclosed on p. 14 line 13, on p. 14 line 14 "The illuminator IL" should be Illumination system IL as disclosed on p. 14 line 12, on p. 14 line 18, "the beam PB" should be projection beam PB as disclosed on p. 13 line 21, on p. 14 line 20, "the source LA" should be radiation source LA as disclosed on p. 13 line 22, on p. 14 line 27 "The beam PB" should be projection beam PB as disclosed on p. 13 line 21.

The disclosure is objected to because of the following informalities: it does not contain titles such as Background of the Invention (spec. p. 1 line 4), Brief Summary of the Invention (spec. p. 8 line 7), Brief Description of the Drawings (spec. p. 13 line 3), Detailed Description of the Invention (spec. p.13 line 15) etc...

Appropriate correction is required.

Claims 24-27 are objected to because of the following informalities: claim 24, lines 9 and 11, the phrase "said support structure" has a lack of antecedent basis. Claims 25-27 depend from claim 24 and thus contain the same deficiencies. Appropriate correction is required.

Drawings

Figure 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated (spec p. 17 lines 10-11). See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "grid grating mounted on a reference frame and ... one sensor head mounted on said moveable object" (Clms 5,9,14,28,29,30), "a memory....a data processing means" (Clms 15 and 28), "an image sensor" (clms 24-27), "a first substrate table...a second substrate table" (Clms 38-43) and "a displacement measuring system that measures the position of a moveable object, comprising... said first substrate table...comprising...one grid grating" (Clms 38-41) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

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As best the examiner is able to ascertain the meaning of the claims the following rejections are made:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 22,23 and 37 are rejected under 35 U.S.C. 102(e) as being anticipated by Nishi et al (US 6400441).

Re clms 22,37: Nishi et al discloses a device manufacturing method comprising the steps of: providing a substrate that is at least partially covered by a layer of radiation sensitive material (Nishi et al Col 1 lines 38-40), said substrate being supported by a substrate table (Nishi et al Col 1 lines 44-45), providing a projection beam of radiation (Nishi et al Col 1 line 18), using patterning structure to endow the projection beam with a pattern (Col 1 lines 35-37), said patterning structure being supported by a support structure (Nishi et al Col 7 line 13), projecting a patterned beam of radiation onto a target portion of the layer of radiation sensitive material (Nishi et al Col 3 lines 35-39), and measuring displacement of one of said support structure and said substrate table in

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at least two degrees of freedom using at least one grid grating and at least one sensor head (Nishi et al Col 97 lines 44-48).

Re clm 23: device (Nishi et al W1)

Claims 24 and 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Taniguchi et al (US 6151122).

Re clm 24: Taniguchi et al discloses a method of calibrating a lithographic projection apparatus comprising the steps of: providing patterning structure having a reference pattern held in a movable support structure (Taniguchi et al Col 15 line 7), said reference pattern having a plurality of reference marks at pre-calibrated positions in at least a scanning direction of the lithographic projection apparatus (Taniguchi et al Col 15 lines 50-58), holding an image sensor on a substrate table at a constant position relative to a projection system (Taniguchi et al Col 17 lines 39-45), positioning said support structure so as to project an image of each of said reference marks in turn onto said image sensor (Taniguchi et al Col 15 line 66- Col 16 line 6), and measuring the position of said support structure in at least a first degree of freedom when each of the reference marks is projected onto said image sensor (Taniguchi et al Col 15 lines 57-64).

Re clm 25: image sensor positioned under center line (Taniguchi et al, performed in Fig 3)

Re clm 26: image sensor positioned at an extreme position (Taniguchi et al Col 16 lines 2-6)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1,3,5,6,8,9,10,12,14,15,18-21,28,30-33,35,36,38-40 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishi et al (US 6400441).

Re clms 1,3,18,20,21,31,38: Nishi et al discloses a lithographic projection apparatus comprising: a radiation system (Nishi et al IOP), a support structure (Nishi et al RST) that supports a patterning structure (Nishi et al R), a first substrate table (Nishi et al WS1) that holds a first substrate (Nishi et al W1), a second substrate table (WS2) that holds a second substrate (Nishi et al W2) a projection system (Nishi et al PL), and a displacement measuring system that measures the position of a movable object (Nishi et al WS1) said displacement measuring system comprising at least one grid grating incorporated directly into the main body of said moveable object and at least one sensor head that measures displacements of the grid grating in at least two degrees of freedom (Nishi et al Col 97 lines 44-49). However, Nishi et al does not disclose that the at least one grid grating is mounted on said moveable object. It would have been obvious to one having ordinary skill in the art at the time the invention was made to replace the at least one grid grating incorporated directly into the main body of said moveable object with at least one grid grating mounted onto the main body of said moveable object because it would simplify manufacture, since it has been held that constructing a formerly integral

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structure in various elements involves only routine skill in the art. *Nerwin v. Erlichman*, 168 USPQ 177, 179.

Re clm 19: interpolator (Nishi et al 90)

Re clms 5,30,32: Nishi et al discloses the claimed invention as noted above including at least one grid grating mounted on a moveable object (Nishi et al WS1) and a sensor head that measures displacement of the moveable object (Nishi et al Col 97 lines 44-49). However Nishi et al does not disclose that the at least one grid grating is mounted on a reference frame and the sensor head mounted on the moveable object. It would have been obvious to one having ordinary skill in the art at the time the invention was made to mount the at least one grid grating on a reference frame and the sensor head on the moveable object to increase throughput, since it has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

Re clms 15,28,33: a memory and data processing means (Col 53 lines 57-64)

Re clms 6,8,9,36,39: scan imaging (Nishi et al Col 98 lines 2-3) and the grid grating has a length greater than or equal to the range of motion of the moveable object (inherent since a grating having a length of at least equal to the range of motion of the wafer stage is needed for the apparatus to function because the grating replaces the function of the interferometer)

Re clm 42: Nishi et al discloses a lithographic projection apparatus comprising: a radiation system (Nishi et al IOP), a mask table (Nishi et al RST) that holds a mask (Nishi et al R), a first substrate table (Nishi et al WS1) that holds a first substrate (Nishi et al W1), a second substrate table (Nishi et al WS2) that holds a second substrate

(Nishi et al W2), a projection system (Nishi et al PL), and a displacement measuring system that measures the position of said mask table using an interferometer (Nishi et al Col 49 lines 33-41). However Nishi et al does not disclose a displacement measuring system that measures the position of said mask table where said displacement measuring system comprises at least one grid grating mounted on said mask table and at least one encoder head that measures displacements of the grid grating in at least two degrees of freedom. Nishi et al teaches that interferometers can be replaced by grid gratings and encoder heads that measure displacements of the grid gratings in at least two degrees of freedom because it increases throughput (Nishi et al Col 97 lines 44-49). Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the displacement measuring system that measures the position of said mask table using an interferometer with a displacement measuring system that measures the position of said mask table using at least one grid grating and an encoder head that measures displacement of the grid grating in at least two degrees of freedom because it would increase throughput as suggested by Nishi et al.

Re clms 10,12,14,35,40: Nishi et al discloses the claimed invention except for the location of the grid grating being substantially coplanar with a substrate held by the substrate table or a patterning structure supported by a support structure. It would have been obvious to one having ordinary skill in the art at the time the invention was made to locate the grid grating substantially coplanar with a substrate held by the substrate table or a patterning structure supported by a support structure to ensure accurate

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measurements, since it has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

Claims 2,4,7,11,13,16,41 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishi et al (US 6400441) in view of Miyachi (Reg. Number H1774).

Re clms 2,4,41,43: Nishi et al discloses the claimed invention as noted above. However, Nishi et al does not disclose using two grid gratings mounted on the moveable object at spaced apart locations and two sensor heads. Miyachi teaches the use of two grid gratings mounted at spaced apart locations and two sensor heads because it increases accuracy (Miyachi Col 9 lines 39-45). Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use two grid gratings mounted at spaced apart locations and two sensor heads in the apparatus of Nishi et al because it would increase accuracy as taught by Miyachi.

Re clm 7: scan imaging (Nishi et al Col 98 lines 2-3) and the grid grating has a length greater than or equal to the range of motion of the moveable object (inherent since a grating having a length of at least equal to the range of motion of the wafer stage is needed for the apparatus to function because the grating replaces the function of the interferometer)

Re clms 11,13: The combination system of Nishi et al and Miyachi discloses the claimed invention except for the location of the grid grating being substantially coplanar with a substrate held by the substrate table. It would have been obvious to one having ordinary skill in the art at the time the invention was made to locate the grid grating substantially coplanar with a substrate held by the substrate table to ensure accurate

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measurements, since it has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

Re clm 16: optical sensor measures D.O.F. (Miyachi, z-direction Col 9 lines 44-45)

Claims 17,29 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishi et al (US 6400441) in view of Stanton et al (US 5654540).

Re clms 17,29,34: Nishi et al discloses the claimed invention as noted above. However, Nishi et al does not disclose each grid grating includes a reference mark. Stanton et al teaches that a grid grating should include a reference mark to ensure accurate measurements (Stanton et al Fig 11). Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include a reference mark on the grid grating of Nishi et al because it would ensure accurate measurements as suggested by Stanton et al.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Taniguchi et al (US 6151122) in view of Nishi et al (US 6400441).

Re clm 27: Taniguchi et al discloses the claimed invention as noted above including an interferometer (8) to measure the position of a moveable support structure (4A).

However Taniguchi et al does not disclose using a grid grating and sensor head to measure the position of the moveable support structure. Nishi et al teaches that interferometers can be replaced by grid gratings and encoder heads to measure the position of moveable support structures because it increases throughput (Nishi et al Col 97 lines 44-49). Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the interferometer that measures the

position of the moveable support structure in the apparatus of Taniguchi et al with a grid grating and an encoder head because it would increase throughput as suggested by Nishi et al.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Matsui et al 4673816, Yasuda et al 6278957, Ota 5942357, Hirukawa et al 5402224, Smith et al 5828455, Goldberg 6307635 and Taniguchi 6310680.

Note: a signed copy of two IDS's filed 3-7-03 and one IDS filed 3-18-03 is attached to this Office Action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khaled Brown whose telephone number is 703-306-5738. The examiner can normally be reached on M-F 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on 703-308-4881. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1782.

KB
December 15, 2003

